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Quality Control Methods During Project Development

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Abstract: Quality is the basis for the success of modern enterprises. From the perspective of commodities, it is the function and attribute of the products provided by enterprises to customers, and it is the contract between enterprises and customers. An enterprise sells products and provides customers with use value to obtain commodity value. Part of the surplus value in the process becomes the profit of the enterprise. It can be seen that the good or bad development of the enterprise depends ultimately on quality. Starting from the specific details of quality control, this paper elaborates how to carry out quality control of specific projects through the formulation of quality requirements, the establishment of quality system, and the specific methods of quality control, aiming to provide certain methods for promoting product quality.
Keywords: Quality; Control; Method

1. Quality requirements

1.1 Quality objectives

The quality objectives of product development are as follows:

a)Ensure that the product functions and performance indicators meet the requirements of the development contract;

b)The technical state of the product is controlled;

c)All product quality problems were eliminated.

d)Strictly control the work quality of personnel, machine, material, method, environment and measurement.

1.2 Quality assurance principles

The principle of product development quality assurance is as follows:

a)The principle of " Quality is uppermost."

In the process of product development, production and use, we should always adhere to the principle of "Quality is uppermost.", implement high-quality projects, and implement quality control in the whole process, in stages and with emphasis.

b)The principle of "Three no's principle "

Unqualified raw materials will not be put into production, unqualified parts will not be assembled, and unqualified products will not be delivered, so as to ensure that all performance indicators of products meet the requirements of product drawings and technical indicators.

c)"Zero" principle

The technical zeroing of quality problems should meet the five requirements of "accurate positioning, clear mechanism, problem recurrence, effective measures, and drawing inferences from one instance", and the management zeroing should meet the five requirements of "clear process, clear responsibility, implementation of measures, serious treatment, and improvement of regulations".

1.3 Requirements of product quality assurance program

The research and development of products should always implement the relevant quality documents that have been formulated, establish everyone's awareness of "quality first", and carry out various works with the goal of establishing "high-quality project". The responsibility, authority and mutual relationship of quality assurance in the development and trial production shall be implemented according to the relevant contents of the quality manual of each company. Put forward clear requirements, such as:

a)The Sales Department is responsible for the centralized management of contract review, organizing product contract review,

and ensuring the smooth implementation of the contract and meeting the contract requirements; Be responsible for the collection, storage and transmission of product information, and participate in the processing of product information; Responsible for after-sales service of products; And timely feed back user quality information to the technical department, quality department and relevant departments according to the procedure.

b)The technical department is responsible for the management of technical quality documents in the development process, strictly implementing the technical status management, implementing the distribution, storage and change of technical documents according to the technical status management system, and verifying the aftereffect of process changes.

c)The administrative department is responsible for personnel training and qualification assessment, and evaluation of training effect; While continuously improving the technical quality of employees, we should strengthen the quality awareness education to ensure that the staff who affect the product quality can be competent for their work.

d)The production department is responsible for the inspection of process equipment and trial production, the effective control and management of the production site, the formulation of corresponding control procedures, standards and assessment methods, the effective control of the balance of input and output, the product identification, the storage and distribution of semi-finished products and other links, the establishment and improvement of the guarantee system of balanced production, the establishment and improvement of the safety production system, and the environmental conditions necessary to ensure the product quality and safety production; Be responsible for tooling processing and management; Allocate corresponding equipment according to production requirements, and evaluate, confirm and organize maintenance according to the plan to maintain the applicability of the equipment.

e)The quality department is responsible for the quality control of raw materials and purchased equipment. Be responsible for organizing the inspection and evaluation of the quality assurance ability of suppliers, and organizing procurement according to the list of qualified suppliers; Prepare procurement documents in strict accordance with standards, technical documents, quality management documents, etc., sign contracts or agreements in accordance with them, and be responsible for the quality of the purchased materials; Strictly implement the incoming re-inspection system of purchased products, and timely submit overdue products to the Quality Department for re-inspection; The storage and distribution system of raw materials and equipment shall be strictly enforced to prevent quality problems caused by poor storage or wrong storage, mixed materials, etc. of purchased products. Be responsible for the verification of raw materials and supporting parts and the inspection of products, and submit the products to the customer representative for inspection; Be responsible for the inspection and periodic verification of tooling and moulds; Be responsible for the calibration and periodic verification of measuring devices; Take the lead in organizing the inspection of process discipline and special process; Be responsible for the management of product inspection status identification and effective control of nonconforming products, and analyze and deal with product quality problems.

1.4 Documents related to product quality assurance

1.4.1 Preparation of quality documents

Establish a documented quality management system and prepare the requirements of Quality Manual and Procedure Document. According to the requirements of the system standards, the system documents shall be classified and archived, and the list of controlled documents and quality records shall be established to ensure that all places where the system operates have applicable versions of relevant documents, so as to achieve timely filing and distribution.

In the process of development, organize and carry out product quality control planning, and carry out quality control over the whole process of product development to ensure product quality control.

1.4.2 Implementation of quality documents

Prepare the product quality assurance program, specify the quality objectives of product development, participants, equipment models, management responsibilities, technical status management requirements, as well as the quality control requirements for verification, confirmation, monitoring and inspection of the development process. With the progress of product development, revise the quality assurance program in time to ensure the suitability and operability of the quality assurance program.

During the development process, according to the requirements of the quality management system procedure documents and the product quality assurance program, the product quality management work is carried out, and the planning, design, trial production, test and other aspects of product realization are monitored to ensure the standardization of the development work and the stability and reliability of the product quality. During the development process, the technical and quality problems that occur should be returned to zero in time to ensure the quality of the development process is controlled.

2. Quality management system

2.1 Document system

It is necessary to establish a quality management document system, prepare quality manuals, procedure documents and operation guidance documents, and continuously improve them to meet the requirements of product development, production and quality control throughout the process.

2.2 System operation supervision

Establish a quality objective control system, carry out internal audit and management review according to the system requirements every year, and effectively and timely correct the non-conformities in the review, and make statistics and evaluation on the effectiveness and completion of the quality objectives through data analysis and improvement.

In order to ensure the effective implementation of the research and development task and the controlled process quality, a project team can be established to appoint project administrators, designers, quality engineers, standardization engineers, etc. Personnel at all levels and functional departments shall clarify the quality responsibilities, authorities and interrelationships according to the requirements of management procedures, and provide sound organizational guarantee for product quality to meet user requirements.

3. Quality control

3.1 Technical status management

3.1.1 Technical status change

The change of technical documents shall be implemented according to the corresponding technical status management procedure documents.

The basic requirements for technical status change are as follows:

a)Changes required by customers or changes that meet technical requirements, improve product performance and reduce costs.

b)All documents related to changes shall be changed accordingly.

c)Implement according to the changed technical status document to ensure that the product is manufactured according to the changed regulations.

d)Verify changes if necessary.

3.1.2 Technical status change authority

The document changes of the finalized products shall be implemented according to relevant requirements and regulations.

Changes to the technical documents of the products that have been internally identified shall be carried out according to the technical status management procedure and other relevant documents.

3.1.3 Record of technical status

The technical status recording activity shall be carried out from the product proposal stage, and the technical status recording data shall be backed up regularly, the product technical status recording report shall be prepared, and the technical status change and control shall be recorded. The technical status recording document shall be complete and filed.

Record: The technical status record shall record the technical status identification and the technical status documents established during the technical status review, the implementation of status changes and approved changes, the technical status baseline, technical status items, and the deviation or out-of-tolerance treatment.

Report: The following report is issued for the technical status project or the whole product.

a)List of technical status items and technical status documents;

b)Change the deviation and out-of-tolerance status;

c)Change execution and validation results.

d)Analysis: The company shall conduct the following analysis:

Analyze the identified problems to find out the trend of the problems;

Evaluate the corrective measures and verify whether the corresponding problems have been solved or whether new problems have arisen.

e)Record: The record of technical status shall be sorted out by the record department, and the product archive data room shall be responsible for filing and keeping.

3.1.4 Technical status review

3.1.4.1 Functional technical status review

The functional technical status audit is to verify that all performance parameters of the product meet the requirements specified in

the functional baseline and distribution baseline by testing and analyzing the first (batch) production part. The general audit method is:

a)Sample performance test;

b)Product quality review;

c)Internal identification.

3.1.4.2 Physical technology status review

Through the review of documents and the inspection, test and assessment of the first article (batch), whether it fully meets the requirements specified in the technical status document, the review method is as follows:

a)Review relevant engineering drawings, product specifications, process and material specifications, design documents and other supporting documents, issued engineering documents and relevant quality records.

b)First article inspection and data.

c)Trial production batch summary.

The technical status audit shall be organized and implemented by the technical department according to its responsibilities and the specific requirements of the audit method. The documents formed after the technical status audit shall be consistent with the documents formed by the results of various audit methods (such as test, review, identification and summary).

a)Establish the product baseline after the review of physical technical status.

b)The technical status management shall be implemented according to the technical status management procedure and other relevant documents to ensure that the developed products meet the specified functional and physical characteristics.

c)Product identification and inspection status identification shall be implemented according to regulations.

3.2 Design

3.2.1 Design analysis

At the initial stage of the scheme design, carry out the planning of product design and development, form the product design and development input specification and design and development plan, determine the review, verification and confirmation activities required at the product development stage and each stage, and form the corresponding overall product design plan report.

Conduct characteristic analysis on all parts of the product, form an analysis report, define key parts and important parts, and formulate and implement quality control procedures for key parts and important parts. The supplier is required to provide key and important parts that meet the requirements of standards, contracts or orders. In the process of product realization, key parts and important parts shall be identified to ensure the traceability of key parts and important parts. To ensure the continuous and effective quality control of key and important parts, the organization shall review and record the quality control of key and important parts during internal audit. The organization shall keep records of key and important parts and file them in a timely manner. The storage period shall be consistent with the product life cycle.

3.2.2 Design report

During product design, the key and important characteristics of the product shall be analyzed according to the provisions of the national standard, the characteristic analysis report shall be formed, and the product shall be classified. Identify key and important parts on product design drawings and documents. The technical department shall prepare the list of key and important parts, which shall be countersigned by the process and quality departments and approved by the main responsible person.

The design documents, drawing data, various summary tables and other documents formed during the design process shall be reviewed, signed and approved according to the document control requirements in the quality management system. The design documents shall be prepared in accordance with the relevant national standards, industrial standards and system regulations for technical drawings, and shall be signed completely. The design documents shall be basically complete, coordinated and unified, and the quality shall be controlled.

3.2.3 Stage review

According to the requirements of the quality management system and the project quality assurance program, the product carries out quality control on the design process and strictly implements the design review system. The review is comprehensive, objective and responsible. The project quality engineer shall participate in each review of the project and strictly supervise the analysis and implementation of the review expert opinions.

3.3 Process

3.3.1 Process control

The products shall adopt mature technologies, products and processes of similar equipment as far as possible, as well as process plans, process routes and process procedures. During the production process, all kinds of process documents shall be strictly

implemented. The production equipment and inspection equipment shall be verified to be qualified and within the validity period of verification. The production operators and inspection personnel shall be trained and qualified to work with certificates. The key processes shall be 100% inspected. The first article of special processes shall be confirmed. The control procedures for unqualified products shall be strictly implemented. Define quality control and acceptance index quality requirements for key and important parts according to procedures.

The process documents shall be prepared in accordance with the relevant provisions of the company's procedure documents and standardized documents, and shall be approved and countersigned by the relevant responsible departments, and distributed as required to ensure that the documents used at the production site are the current valid versions.

The process procedures can guide production and have operability.

3.3.2 Key processes

Key process control procedures shall be implemented for the control of key processes of products. Prepare the key process directory and key process quality control parameters, and paste or mark the "key process" identification before the key process number of the process card and the process specification involved in the manufacturing process. The key process control card specifies the control contents of human, machine, material, method and environment.

Personnel related to key processes shall be trained and qualified before taking up their posts with certificates. In the process of processing and assembly, according to the requirements of the quality control card of key processes, the personnel, equipment and process methods shall be fixed. During the implementation of key processes, the operators shall check and control the production conditions as required to ensure that the process is under control.

3.3.3 Special process

The confirmation of special processes shall be carried out by the technical department according to the provisions of the special process confirmation procedure, and shall be checked and assessed regularly.

Qualified personnel shall complete the process operation, continuously monitor and control the process parameters, and control according to the process.

Prepare operation instructions to guide on-site operation, make original records, and ensure that the quality of special processes meets the specified requirements. Special process records are complete and traceable.

3.3.4 Process documents

The quality control of documents and technical data shall be implemented in accordance with the relevant technical document management procedures.

The basic requirements, classification, procedures and provisions of the change of process documents shall be controlled according to relevant documents to ensure the correctness and uniformity of the change of process documents.

3.3.5 Disposal of nonconforming products

The control of nonconforming products (including nonconforming products of purchased products) shall be carried out in accordance with the provisions of the supporting documents of the quality system, to ensure that the products that do not meet the product requirements are isolated, identified, recorded, reviewed and handled, and to prevent their unexpected use or delivery identification and control.

The review organization and system of nonconforming products shall be sound and complete, with clear responsibilities and authorities. The qualification of nonconforming product review personnel shall be confirmed and approved by the General Manager

The inspector's identification, identification, isolation, review, disposal, record and other activities for nonconforming products shall meet relevant requirements.

The report and disposal of nonconforming products shall comply with the review procedures of nonconforming products and meet relevant requirements; Waste products shall be isolated in time, and accounts shall be established, kept and disposed.

References:

[1] Guo Weiwei Guo. Quality control strategy study during the ADCR software product development process [D]. Southeast University, 2018.

[2] Zhang Siqi. Research on the Application of Synchronous Engineering in the Quality Management of Engine Development Project [D]. Shanghai Jiao Tong University, 2015.